ATTACHMENT #10
CLOSURE PLAN/QUALITY ASSURANCE PROJECT PLAN (QAPP)

CONTENTS

ACRONYMS AND ABBREVIATIONS

DCD	Desert Chemical Depot
CASARM	Chemical Agent Standard Analytical Reference Material
DQO	Data Quality Objective
ERDEC	Edgewood Research Development and Engineering Center
EPA	Environmental Protection Agency
GA	Tabun, ethyl N, N-dimethylphosphoramide-cyanidate
GB	Sarin, isopropylmethylphosphonofluoridate
H	Levinstein mustard, bis-(2-chloroethyl) sulfide
HD	Distilled mustard, bis-(2-chloroethyl) sulfide
HT	Mixture of bis-(2-chloroethyl) sulfide and bis [2(2-chloroethylthio) ethyl] ether
HWMU	Hazardous Waste Management Unit
L	Lewisite, dichloro-2-chlorovinyl arsine
P	Percent Recovery
PAH	Polynuclear Aromatic Hydrocarbon
PMCD	Program Manager for Chemical Demilitarization
ppb	parts per billion
ppm	parts per million
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RFI	Remedial Facility Investigation
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SOP	Standing Operating Procedure
TCLP	Toxicity Characteristic Leaching Procedure
TEADS	Tooele Army Depot South Area
UDSHW	Utah Division of Solid and Hazardous Waste
ug/l	Micrograms per liter
USAEHA	United States Army Environmental Hygiene Agency
USACAMDS	U.S. Army Chemical Agent Munitions Disposal System
VOCs	Volatile Organic Compounds
VX	0-ethyl S-(2-disopropylaminoethyl) methylphosphonothiolate
3X	3X shall mean that the item has been surface decontaminated by locally approved procedures (if required), bagged or contained, and that appropriate tests or monitoring has verified that vapor concentrations of 0.0001 mg/m^3 for agent GB, 0.00001 mg/m^3 for agent VX and 0.003 mg/m^3 for agents H and L do not exist. Monitoring is not required for completely decontaminated and disassembled parts that are simply shaped (no crevices, threads, etc.) and are made of essentially impervious materials (simple lab glassware, steel gears, etc.)

CLOSURE PLAN

10.1 CLOSURE PLAN

This closure plan has been prepared in accordance with Code of Federal Regulations, title 40, chapter 264, Subpart G (40 CFR 264), section 264 and 270 for the U.S. Army Chemical Agent Munitions Disposal System (USACAMDS). The plan describes general closure requirements for the USACAMDS site and hazardous waste management units included in this permit.

10.2 CLOSURE PERFORMANCE STANDARD

USACAMDS prepared this closure plan to be protective of human health and the environment during and after closure. These activities will control, minimize, or eliminate post-closure escape of hazardous waste, hazardous waste constituents, and hazardous waste decomposition products. These processes will protect the air, groundwater, and surface water.

It should be noted that the safety regulations for chemical agents described in Army Regulation 385-61 and all local USACAMDS Standing Operating Procedures (SOPs) that outline specific methods/codes for dress or operating procedures will be followed during operations closure.

The Quality Assurance Project Plan (QAPP) for USACAMDS Closure (Sections 10.12 through 10.26) details the quality assurance requirements for the sampling, characterization, and monitoring activities. It contains procedures for sampling the USACAMDS facilities and waste materials. The samples will be used to characterize the waste materials and to determine if the site requires remediation or a risk-based assessment for closure.

10.3 PARTIAL AND FINAL CLOSURE ACTIVITIES

Final closure of the hazardous waste management facilities at USACAMDS will occur following the end of chemical demilitarization and other waste management activities. At that time, the various units permitted under RCRA will be taken out of service. The facilities will be decontaminated by air washing, heating or chemical decontamination.

Because USACAMDS is a multiple process facility, partial closure of the facility could occur while operations in other portions of the plant continue. For example, the useful life of an incinerator could end, requiring closure and possible replacement.

Partial closure plans will be submitted to the Executive Secretary for approval for each hazardous waste management unit (HWMU) pursuant to 40 CFR 264.112(c). These plans detail the sampling information used to characterize the facilities. If cleanup standards are improved before closure begins, the partial closure plans may include the improved cleanup standards. Details of partial closure plans will include a list of analytes, map of sampling locations, and the number of samples to be collected. These plans will be submitted to the Executive Secretary for approval at least 60 days prior to beginning closure activities.

10.4 MAXIMUM WASTE INVENTORY

The inventory of hazardous wastes will be managed in accordance with the requirements of the Utah Hazardous Waste Management Regulations (the Rules) for storage facilities and other HWMUs undergoing closure. The maximum USACAMDS storage and treatment capacity of waste material is listed in the Table 10-1 below.

Table 10-1
Treatment Areas - Maximum Waste Inventory

Waste	Amount
Brine	45,000 gallons
Agent	2,300 gallons
Salt and miscellaneous solid wastes	617 cubic yards
Explosives from munitions	0.5 tons
Spent Decontamination Solution	3,200 gallons
Furnace Inventory	1 ton

When hazardous waste related operations conclude, all hazardous waste containers and residues, including waste piles, will be shipped off-site to an approved hazardous waste management facility. During container removal, USACAMDS personnel will assure that containers are in good condition, and that no leaks have occurred. Should there be any indication of corrosion or damage, personnel will transfer stored wastes to containers that are in good condition.

Hazardous waste liquids will be managed on-site during closure in a permitted incinerator whenever possible. PAS brines will be treated in the brine dryers or sent off site to an EPA-approved Treatment, Storage, and Disposal Facility (TSDF). All other waste liquids will be disposed of in the appropriate permitted incinerator or sent off site to an EPA-approved TSDF for treatment and/or disposal.

For a waste to be treated in a particular permitted furnace, a trial burn must be performed. Each incinerator must demonstrate its efficiency. Only incinerators that have proven efficiency and that have been approved by the State for a particular waste will be used to treat that waste. Waste streams that have not been destroyed through a demonstrated and approved trial burn will not be treated in the USACAMDS incinerators.

Table 10-2 lists all permitted storage tanks and capacities. Table 10-3 lists the storage areas and capacities.

TABLE 10-2
PERMITTED STORAGE/TREATMENT TANKS

Tank Description	Location	Capacity (gal.)
Agent Tanks:		
Rocket Shear Line Area, Tank 1 (SEG-T1)	ECC/Segregator	300
Rocket Shear Line Area, Tank 2 (SEG-T2)	ECC/Segregator	300
Multipurpose Demilitarization Machines Area, Tank 3, (MDF-T3)	MDM	300
Multipurpose Demilitarization Machines Area, Tank 4, (MDF-T4)	MDM	300
Liquid Incinerator Room, Tank 5, (LIC-T5)	LIC Primary Chamber	300
Agent Storage Room, Tank 6, (ASR-T6)	LIC Agent Tank Room	300
Agent Storage Room, Tank 7, (ASR-T7)	LIC Agent Tank Room	500
Brine Drying Area Brine Holding Tanks:		
Tank T13-A	BDA	5,000
Tank T13-B	BDA	5,000
Tank T13-C	BDA	5,000
Tank T13-D	BDA	15,000
Tank T13-E	BDA	15,000
Toxic Maintenance Facility Waste Liquid Storage Tanks:		
Tank TMF-1	TMF	1,600
Tank TMF-2	TMF	1,600

Table 10-3
Container Storage & Waste Piles - Maximum Waste Inventory

Container Storage HWMU	Maximum Inventory
Building 4104	23,760 gallons
Building 4105	83,600 gallons
ETF	40,260 gallons
MHA	4,040 gallons
MPF	17,160 gallons
RSA	6,600 gallons
SEG/ECC #1	5,280 gallons
MTF	4,400 gallons
TMF	6,600 gallons
VSA	13,770 gallons
ATF	33,000 gallons
MDM/CG	1,700 gallons
MDF Toxic UPA	680 gallons
MPF Charge Car Room	170 gallons
BIF Drain Bay	680 gallons
MDF/BIF Airlock	680 gallons
MDF/BIF Loading Area	1,700 gallons
Note: The quantities presented above are the total volumes of container storage and waste piles (if any) combined.	

If the wastes from 4104 were transported to an off-site approved TSDF for further treatment and eventual disposal, 270 drums (55 gallons) could be removed each week. The maximum estimated inventory at final closure is 432 drums. Therefore, the inventory can be removed in a minimum of 20 days. All wastes in Building 4105 will require final treatment and disposal at an off-site approved TSDF. The maximum inventory of waste stored in Building 4105 at final closure is 83,600 gallons, or 1,520, 55-gallon drums. A transporter operating under the same conservative constraints would take 34 days to transport the waste to a hazardous waste TSDF for further treatment and eventual disposal. The maximum capacity in the MDF/BIF area is 5,440 gallons. Because the waste would most likely be agent, the total time to dispose of the waste would be two and a half weeks.

10.5 GENERAL CLOSURE PROCEDURES

At the end of each chemical agent window and at the end of the final test plan, USACAMDS facilities and equipment used in each test will be thoroughly decontaminated to a minimum 3X level. The areas will receive one final rinse to wash away the last decontamination solutions. All of these collected wash liquids will be managed as described in the Waste Liquid Collection System (Tank Systems) in Attachment 13. The decontamination process will be recorded in the permitted unit's operating record in accordance with R315-8-5.3. These procedures are summarized in the description for each unit type.

Waste generated during closure will be recycled, reclaimed, disposed of on-site, or disposed of at an EPA approved TSDF. Materials that can be used at a government facility familiar with managing agent will be decontaminated to a 3X level and sent to the other facility. Recyclable metal wastes that are decontaminated to a 5X level may be managed according to current DSHW regulations and policy. 5X level is a Department of Army designation for materials that have had agent exposure that have been decontaminated. These materials are cleaned to a 3X level and processed through the furnace. All F999 wastes that are not reused by other government agencies or does not have a 5X designation will be managed as hazardous wastes.

While the incinerators are operational, 3X, 5X and possibly other materials that cannot be reused, reclaimed or recycled will be declared waste. Wastes that have been demonstrated in the furnaces will be treated on site. Wastes that have not been demonstrated will be decontaminated to a 3X level and sent off site to an EPA approved TSDF. The appropriate packaging, manifesting, and transportation requirements will be met.

Before a waste can be incinerated in a particular USACAMDS furnace, a trial burn must be performed. Each incinerator must demonstrate its efficiency. Only incinerators that have proven efficiency and have been approved by the Executive Secretary for a particular waste will be used to treat that waste. Waste that has not had a trial burn will not be treated in the USACAMDS incinerators.

10.5.1 List of Hazardous Waste Management Units

CAMDS operates HWMUs for treatment, bulk storage, and container storage. Also, the site has several Subpart X facilities and other miscellaneous facilities that will require closure. These HWMUs are:

Treatment Units:

- Deactivation Furnace System (DFS)
- Liquid Incinerator (LIC)
- Metal Parts Furnace (MPF)

Bulk Storage Areas (Table 10-2 has additional information on tank storage units):

- Agent Tanks
- Brine Drying Area Holding Tanks (BDA Tanks)
- Toxic Maintenance Facility Tanks (TMF Tanks)

Container Storage Areas (Table 10-3 has additional information on container areas):

- Auxiliary Test Facility (ATF)
- Building 4104
- Building 4105
- Equipment Test Facility (ETF) Area
- Munitions Holding Area (MHA)
- Metal Parts Furnace (MPF) Area
- Residual Storage Area (RSA)
- Segregator/Explosives Containment #1 (SEG/ECC #1)
- Material Treatment Facility (MTF)
- Toxic Maintenance Facility (TMF)
- Ventilated Storage Areas (VSA)
- Multipurpose Demilitarization Machine Processing Area and Conveyor Gallery (MDM/CG)
- Metal Parts Furnace (MPF) Charge Car Room
- Multipurpose Demilitarization Facility (MDF) Toxic Unpack Area (MDF Toxic UPA)
- Bulk Item Facility Drain Bay (BIF)
- MDF/BIF Airlock
- MDF/BIF Loading Area

Subpart X Units and Other Miscellaneous Areas:

- Brine Dryers
- Brine Evaporator
- Bulk Drain Station
- Heated Discharge Conveyor (HDC)
- Multipurpose Demil Machine (MDM)
- Projectile/Mortar Disassembly (PMD)
- Rocket Sheer Machine (RSM)
- Rocket Separation Machine (APE 1240)

- Material Decontamination Chamber 2 (MDC2)

Miscellaneous Facility:

- Sample Analysis Facility (SAF)
- Site Medical Facility (SMF)
- Roadways
- CDS sump (4A) in Bldg. 7048

10.5.2 Facility Closure Procedures

Facility closures will include the treatment and disposal of all hazardous wastes in the on-site inventory. This is described in Section 10.4, Maximum Waste Inventory. The walls, floors, sumps and equipment of each facility will be decontaminated to a 3X level, rinsed, and sampled for contamination. All wash and rinse water will be appropriately screened for agent and other contaminants. Residues will be sampled. Other samples will be collected based on a review of the operating record. Documentation of decontamination will be contained in the permitted unit's operating record.

The sites will be closed based on the sample results. The Quality Assurance Project Plan (Sections 10.12 through 10.26) details sample collection and analysis methods. The primary goal of USACAMDS is to remove contaminants at the site to below regulatory limits or background values. A risk-based assessment may be used to determine closure requirements, depending on the extent of contamination. Wastes that will be generated or managed during closure activities include waste residues, decontamination solutions, rinse water, soils, concrete, and other debris.

A partial closure plan addressing each HWMU will be submitted to the Executive Secretary for approval. HWMUs to be closed are incinerators, bulk storage tanks, containerized storage areas, and subpart X units. Some miscellaneous units will also require closure.

Contaminated items such as brushes, mops, and buckets used in the cleanup operations will be burned in the MPF or DFS if appropriate or sent to an EPA approved TSDF. Any remaining residue will be disposed of at an approved hazardous waste management facility.

10.5.2.1 Floors,

Floors, except in Buildings 4104 and 4105, will be flushed with excess clear water to remove all residual contamination and allowed to air dry. Decontamination solution will be applied with a mop in storage areas that do not have secondary containment as part of a design feature. The floors in Building 4104 and 4105 will be swept.

The sweepings and rinse water will be containerized and characterized for hazardous waste constituents as determined by a review of the operating records. The rinsate will be sampled. Chip samples will be collected from the floors as described in section 10.16.4. Air samples will be collected in any building used to manage chemical agent related wastes as described in section 10.16.2. If the chip and air samples do not contain contaminants above the established standards, the building will be considered clean, and

closure activities complete. At least two samples of appropriate media will be collected at the entrances to Buildings 4104 and 4105.

Core samples will be collected from cracked flooring and analyzed for agent, agent hydrolysis products and other hazardous contaminants as determined by a review of the operating record. Contaminated flooring will be removed at least six inches on each side of the separation. The soil underneath the cracks will be sampled for agent, agent hydrolysis products and other hazardous contaminants as determined by a review of the operating record. If contaminated, the soil will be removed or a risk-based assessment done for the area.

If a floor cannot be cleaned below Toxicity Characteristic Leachate Procedure (TCLP) regulatory levels or chemical agent breakdown products are detected, the floor will be broken up, removed, and disposed of at an EPA approved hazardous waste management facility. If concrete is contaminated, soils immediately under the floor and at one foot below the surface will be sampled as outlined in section 10.16.5. These samples will be analyzed for chemical agent, agent hydrolysis products, and other hazardous contaminants.

If the soil does not show the presence of contaminants, the secondary containment system will be closed. If TCLP regulatory levels are exceeded, total metals are found above background levels or chemical agent breakdown products are detected, soil will be excavated in one-foot lifts until clean samples are obtained. Any discolored areas on the concrete floor will be grit blasted, or equivalent method, until all discoloration is removed. The concrete will then be sampled in the areas that are grit blasted. If the contamination or discoloration continues to the soil under lying the concrete base, soil samples will be taken at the soil surface and 1 foot below. Any soil samples obtained will be analyzed for hazardous waste constituents as determined by a review of operating records. The spent blast grit will be collected, containerized, and managed appropriately. A risk-based assessment may be used to determine closure requirements if the soil is contaminated.

All cracks, voids, and expansion joints found in the concrete base of Building 4104 and 4105 at closure will be cleaned using a compressed air lance prior to sweeping. The residue generated will be treated as potentially contaminated floor sweepings. Samplers will collect grab samples of the residue.

10.5.2.2 Sumps

Sumps will be flushed with excess clear water to remove all residual contamination and allowed to air dry. The rinse water will be containerized and characterized for hazardous waste constituents as determined by a review of the operating records.

Core samples for agent and other analytes will be taken from each sump as described in section 10.16.3. The sumps will be managed as F999 hazardous waste for disposal purposes. The soil underneath each sump will be characterized for agent hydrolysis products and other applicable parameters such as total metals and volatile organic compounds based on a review of the operating records. If contaminated with substances other than chemical agent or chemical agent breakdown products, the soil will be cleaned up to background or risk-based standards. If contaminated with chemical agent or

chemical agent breakdown products, the soil will be removed until chemical agent or chemical agent breakdown products are no longer detected in soil and air samples.

10.5.2.3 Management of Spent Decontamination Solutions, Rinsate and Cleaning Water

Most used or spent decontamination solutions and rinse waters flow into floor sumps designed for this purpose. Clean up crews will decontaminate areas that do not have sumps or secondary containment with mops. Table 10-4 lists the decontamination solutions for each agent. These liquid wastes are analyzed at the on-site laboratory for agent using USACAMDS QA/QC procedures. Rinsate and cleaning water will also be sampled for chemical agent hydrolysis products. Samples for other analytes may be collected based on a review of the operating records.

Table 10-4
SOLUTIONS FOR CHEMICAL DECONTAMINATION

	Type of Chemical Agent Most Recently Handled		
Process	**GA/GB**	**VX**	**H/HD/HT/L**
Decontamination Solution	10% Na_2CO_3 (Aqueous Solution) 10% NaOH	5% NaOCl (Aqueous Solution)	5% NaOCl (Aqueous Solution)
Flushing Solution	Clear H_2O	Clear H_2O	Clear H_2O

Note: Repeat cleaning process as necessary until no chemical agent is detected and chemical agent hydrolysis product contamination is below drinking water standards. Decontamination solution may be changed as required

Contaminated liquid wastes and all spent decontamination solution will be disposed of in the incinerators as approved by the state or at an EPA-approved TSDF. Salts will be sent to an EPA-approved hazardous waste disposal facility.

If appropriate, waste liquids and cleaning solutions contaminated with organics such as hydraulic fluids, lubricating oils, or machine oils will be pumped to an approved waste treatment unit.

10.5.2.4 Material Handling Equipment

Forklifts and trucks used to transport hazardous waste within the facility boundaries will be decontaminated on-site. The surface of the material handling equipment (MHE) can only become contaminated if the container of hazardous waste fails; therefore the MHE is not expected to become contaminated. The MHE used to transport chemical munitions is monitored for agent regularly and is decontaminated when required.

The MHE will be steam cleaned over a catch basin made of plastic sheeting to collect the rinsate generated. The collected rinsate will be analyzed to determine if it is hazardous waste and to determine the method of management. Wipe samples will also be collected to characterize the requirement. If chemical agent or chemical agent breakdown products are detected, the rinsate will be treated at USACAMDS and residues will be disposed of at an off-site TSDF. Samples for other contaminants will be collected based on a review of operating records.

All equipment in Buildings 4104 and 4105 with a large residue buildup will be dry-brushed to remove any contaminants that are present. The brushings will be collected

and analyzed to determine if they are hazardous. The waste will be sampled for agent, agent breakdown products and other hazardous waste constituents as determined by a review of the operating records. If appropriate, agent contaminated residue will be sent to the MPF to be burned.

10.5.2.5 Management of Closure Wastes

Spent decontamination solution and wash water will be sent to the storage tanks. The spent decontamination solution is sampled for agent, pH, and chlorine and incinerated in the MPF. The final rinse water will be sampled for agent, agent breakdown products, and other contaminants as determined by a review of the operating record. Spent decontamination solution will be managed as described above.

Bulk quantities of waste materials such as soils, concrete, and dunnage will be collected in roll-off boxes or other DOT approved containers. The waste will be kept covered. Small volumes of waste may be put in barrels, or other DOT approved containers, and kept closed. The containers will be stored in fenced or otherwise controlled areas away from public access. Therefore, the containers will not be locked.

Containerized wastes will be managed according to the requirements of R315, any permits and as described in Attachment 12 (Container Storage and Waste Piles). The appropriate packaging, manifesting, and transportation requirements will be met. These wastes will be transported using an EPA-approved transportation company. They will be sent to an EPA-approved disposal facility.

10.5.2.6 Description of Security Systems

During closure, the Army will inspect perimeter facility security devices, including the perimeter fence and warning signs, weekly. Necessary repairs will be made in a timely manner and will be recorded in the inspection log.

10.5.3 Hazardous Waste Management Unit Closures

10.5.3.1 Closure of Treatment Units

The furnace systems at USACAMDS include the DFS, LIC, and the MPF. The floors, walls, sumps, equipment, and liquid wastes will be managed as described above. The incinerator units will be decontaminated once the processing of chemical agent and agent-contaminated wastes are completed. Residual chemical agent will be thermally destroyed by running each furnace for at least 24 hours on clean fuel. After the clean fuel burn is complete, the units will be monitored for agent and other contaminants as described in section 10.16. Any chemical agent present on the exterior surface of the incinerator will be neutralized with decontamination solution. The neutralization process will be repeated until chemical agent is no longer detected. A clean water rinse will follow neutralization. The rinse water will be analyzed for agent breakdown products.

All residues will be characterized for agent, agent breakdown products and other hazardous waste constituents as determined by a review of the operating records. Residues will be disposed of as hazardous waste based on the results of characterization.

10.5.3.2 Bulk Storage Areas

Tanks used for the management of hazardous wastes at USACAMDS include the chemical agent tanks and the liquid waste collection tanks for brine and spent decontamination solution. Closure of the facility or tankage will involve emptying the systems. The tanks will be removed during final closure.

Chemical agent will be treated on-site in a permitted incinerator for liquid wastes. Spent decontamination solutions may be treated on-site or sent to an EPA approved TSDF. Brines may be sent to the Brine Dryers or removed off-site to an EPA approved facility. Decontamination of the tanks and associated collection system, including piping, will proceed depending on the type of chemical agent most recently in the system (Table 10-4). The tanks and associated collection systems, including piping, will be decontaminated as follows:

- Each tank will be drained of material and refilled with decontamination solution.
- The solution will be allowed to stand overnight to ensure complete mixing.
- The system will be emptied and flushed twice with water.

Personnel will wear appropriate protective clothing as they perform the following decontamination procedures:

- Draining tanks, feeding chemical agents or spent decontamination solutions to the MPF, DFS, or LIC, and brine to the Brine Dryers
- Fill tanks with the appropriate decontamination solution (Table 10-4), circulate solution overnight; empty system and flush with clear water; empty system, rinse again with water; dispose of solutions and wash water in the LIC
- Test the last rinsate for hazardous constituents pursuant to operating records.

Tanks will be sampled for agent and other hazardous constituents. The tanks will be monitored with ACAMS or DAAMS. The number of wipe samples collected from the exterior and interior of each tank will be specified in a partial closure plan. If rinse water from the exterior and interior of the tanks does not contain agent, agent breakdown products or other hazardous waste constituents, the tanks will be considered to be closed.

If after three rinses the tanks are still contaminated, the tanks will be decontaminated according to the "5X" procedure established by the Department of the Army.

10.5.3.3 Tank Secondary Containment Systems

After the tanks have been cleaned and drained, the secondary containment system for the tanks will be cleaned and closed. The rinse water will be characterized as described in section 10.16.6. Washing will continue until agent and agent breakdown products are no longer detected in rinse water. After rinsing, the secondary containment system will be removed and disposed of in an approved TSDF. A risk-based assessment may be used to determine clean up requirements for underlying soils. Additional site characterization

also may be required. Further characterization activities will be approved through the Executive Secretary.

Floors and sumps will be managed as described in the Facility Closure Section above. The area immediately surrounding the tank system will be sampled for the presence of chemical agents, agent breakdown products and other hazardous waste constituents as determined by a review of the operating records. If concrete, soil, or other samples do not show the presence of contaminants, the surrounding area will be deemed clean and closure will be complete for the tank system. If the samples show the presence of contamination, or the total metals are above background levels, soil will be excavated in one-foot lifts until clean samples are obtained and closure can then be deemed complete. A risk-based assessment may be used to determine alternate closure requirements for contaminated soils.

All piping and other highly contaminated equipment will be incinerated, decontaminated until agent is no longer detected, and then sent to a smelter for reclamation or disposed at an EPA-approved TSDF. USACAMDS will provide information in partial closure plans for management of piping containing agent residues that are difficult to remove or decontaminate.

10.5.3.4 Containerized Storage Units and Waste Piles

10.5.3.4.1 Area 2

Wastes stored in building 4104 can be free liquids or solids. These wastes are stored in containers and waste piles. The wastes stored in 4105 are containerized and have no free liquids. At closure all containers of hazardous waste will be removed from these buildings and disposed of at an EPA approved TSDF. Wastes meeting the "5X" designation may be recycled.

The floors and walls will be cleaned according to the method described above.

Drip pans in Building 4104 are used to provide secondary containment. The drip pans will be managed according to the requirements of R315 and may be treated at USACAMDS or sent to an approved TSDF for final disposal when the inventories of containerized hazardous waste and waste piles have been removed.

10.5.3.4.2 USACAMDS Container Storage Areas and Waste Piles

Permitted USACAMDS storage areas are listed in Table 10-3. These facilities require closure of floors, walls, sumps and equipment, as described above. These areas can be used to store free liquids. All storage facilities except the MHA can be used for waste pile storage.

Waste will be treated on-site when possible. Other wastes will be managed at an EPA approved TSDF. The incinerator that is available for the treatment of wastes stored as waste piles and in containers is the MPF. Most of the waste will be dunnage (wood), spent activated carbon, and personal protective clothing (i.e., DPE suits and Butyl rubber).

In addition, overpacks used as secondary containment will be triple rinsed with decontamination solutions appropriate for the type of chemical agent contained in the overpack. The overpack will be considered an empty container when the triple rinse procedure is completed. The decontamination solution will be sampled for appropriate contaminants. The solutions used to decontaminate the overpack containers will be treated at USACAMDS or at an approved TSDF.

Waste piles, if used, are dry and are kept in covered facilities with concrete floors. Wastes that meet the 5X designation may be recycled. Materials that can be incinerated before the closure of the furnaces will be burned. All other wastes will be sent to an EPA approved TSDF.

10.5.3.4.3 Subpart X Units

Subpart X units include the Brine Drying Area, Bulk Drain Station, MDM, PMD, RSM. When the reduction of all brines to salts has been completed, the Brine Dryers and Brine Evaporator will be cleaned. Excess salts will be scraped off and collected. The final salt scrapings will be tested for hazardous constituents as determined by operating records review and disposed of appropriately.

The process equipment and miscellaneous piping will be cleaned using physical (grit blasting or hydro blasting) and/or liquid residue removal methods. The equipment will then be decontaminated and removed. The interior of the building will be cleaned using high-pressure washing and/or steam cleaning with general or heavy-duty cleaning solutions. Excess salt will be scraped off and collected. Grit blasting or hydro blasting may be used to remove heavier residues before final decontamination. All equipment surfaces will then be rinsed. Rinsate and wipe samples of the equipment surfaces will be collected. Contaminated surfaces will be cleaned until no contamination is detected.

The RSM, MDM and the PMD come in contact with the chemical agent. These processes are located in ventilated areas. These areas will be monitored for agent using ACAMS and DAAMS monitoring. The equipment will be decontaminated using the appropriate decontamination solution as listed in Table 10-4. The equipment will be decontaminated until air monitoring indicates a minimum 3X level. The equipment will then have wipe samples taken to verify the complete neutralization. Some equipment may be further treated and classified as “5X”. These items may be recycled. All other materials and equipment will be considered hazardous waste and disposed of at an EPA approved TSDF.

Samplers will collect wipe samples from the Heated Discharge Conveyor. If no agent is detected, the equipment will not be decontaminated. The facility will be disassembled. Materials that have been treated to the 5X classification may be recycled. All other wastes will go to an EPA-approved hazardous waste TSDF.

10.5.3.5 Miscellaneous Facilities

10.5.3.5.1 Sample Analysis Facility (SAF) and Site Medical Facility (SMF)

Final closure of the SAF will consist of flushing the drainpipes with decontamination solution (Table 10-4), followed by rinse water, to decontaminate any residual chemical

agents present in the drainage piping system. Details of the sampling plan for the drain system and soils will be submitted with the partial closure plan for the laboratory.

These solutions will be sampled for the presence of agent and other contaminants per section 10.16.6. If the solutions and wash water contain agent, or agent breakdown products at any level, the wastewater will be sent to the appropriate incinerator for burning.

Rinse water will be tested to determine if any residual chemical agent or other hazardous waste constituents, as determined by a review of the operating records, are present. Decontamination procedures will be continued until no contamination is detected.

The Site Medical Facility will only have hazardous waste if the decontamination room is used. If used, this room and the associated sump will require decontamination. The decontamination solution to be used depends on the type of agent. Table 10-4 lists the appropriate decontamination solution.

10.5.3.5.2 Roadways and Roadway Shoulders

Roadways within the USACAMDS site will be sampled for the presence of chemical agent, chemical agent hydrolysis products and other hazardous constituents as determined by a review of materials used at the site. These samples will be collected according to the sampling plan in this attachment.

If chemical agent is detected above the standards determined by the Executive Secretary, additional sampling as outlined in section 10.15, will be conducted to determine the extent of chemical agent contamination. If asphalt areas are determined to have chemical agent present they will be removed and managed appropriately.

If chemical agent is detected along the roadways within the USACAMDS facility above the standards, additional sampling will be conducted to define the extent of chemical agent present. Once defined, these areas will be excavated until chemical contaminants are below regulatory standards or background levels. A risk-based assessment may be used to determine clean up standards for soils.

10.5.3.5.3 Contingent Closure Plan

The Department of the Army will clean up all of the Treatment, Storage and Disposal units at USACAMDS to below background and regulatory levels. This contingent closure plan is provided in the event that tank systems without secondary containment at USACAMDS cannot meet this standard. If this occurs, a closure plan will be submitted to the State for approval, detailing closure and post-closure activities. Areas that must be capped will have engineering design and approval.

10.5.3.6 Final Cap

If required, the cap will be designed to cover the extent of contamination with sufficient area for anchoring the cap. The Army will obtain the services of a qualified engineer to develop a cap designed specifically to:

- Provide long-term minimization of migration of liquids through the soil
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settling and subsiding so that the cover's integrity is maintained

The cap will sufficiently cover the area of contamination that could not be removed during implementation of the clean-closure plan. The specific cap characteristics and design will be developed upon implementation of the contingent closure plan.

Procedures for installing the cap will be developed and submitted to the Executive Secretary for approval when the detailed cap design is developed. The time required to install the cover will vary, depending on a number of factors including the number and relative location of areas requiring contingent closure and the cover design.

The cover material will be selected by a qualified engineer at the time the cap is designed.

10.6 CLOSURE SAMPLING AND ANALYSIS PLAN

Hazardous waste management units will be sampled for agent contamination, agent breakdown products and for other hazardous constituents as determined by a review of the operating records. Potential sample locations include floors, sump interiors, equipment, rinse water, residues, roadways, and soils. Sample analytes will be determined using the information contained later in this attachment**.** Analytical methods and sampling procedures are also described later in this attachment. The details for each HWMU will be included in the partial closure plans that will be submitted to the Executive Secretary for approval.

USACAMDS' primary objective is to remove all contamination from the site. A risk-based assessment may be used to determine some closure requirements.

The number of samples collected will be based on an evaluation of each unit near the time of closure. Factors to be considered include stained areas and dimensions of the system. The analytical methods used will be the most current in SW-846 (Test Methods for Evaluating Solid Waste) and the most current Army methods for chemical agent and chemical agent breakdown products at the time of closure. These analytical methods are listed in Table 10-9.

10.7 CLOSURE PLAN COST ESTIMATE

A closure cost estimate is not required for this permit application. State and federal governments are exempt from the financial requirements of 40 CFR Subpart H.

10.8 POST CLOSURE, GROUNDWATER MONITORING, MAINTENANCE PLAN

The closure plan is designed to remove contamination completely from the site. Further actions at the site will not be required under this condition. Post-closure, groundwater

monitoring, and maintenance plans will be established if contamination has occurred from the site that cannot be remediated. Post closure requirements will be determined with the Executive Secretary at time of closure. If it appears that a post-closure permit will be needed at certain units, USACAMDS will begin preparation of a post-closure permit application before final closure of the units.

10.9 SCHEDULE FOR CLOSURE

The closure of the USACAMDS Facility will be completed in six phases. USACAMDS will prioritize sites for closure and submit a plan to the Executive Secretary for approval.

10.9.1 Assumptions Used to Estimate Days to Close

The following assumptions to estimate the days to close the USACAMDS Facility is based on five considerations listed below:

- Time to dispose of waste stored at the facility at the time closure commences.

  The amount of waste to be removed is based on the maximum storage of waste permitted at those locations. Some treatment systems are not permitted to store waste. No estimated time is included to remove the waste for treatment units that are not permitted to store waste.

- Time for disassembly of equipment or system to be closed

  Disassembly of the equipment includes the time to disassemble the system and decontaminate it. In some cases, disassembly will be defined as cutting the system up in order to remove it from the facility. Decontamination of the facility in which the system is located is included as part of this time estimate. Decontamination of the facility includes the walls, ceilings, and floor surfaces as well as any sumps that exist in these areas. It does not include the removal of the sump inserts or the removal of the facility. The definition of the process to decontaminate the facility is detailed in other discussions of the closure plan.

- Sampling and analytical time of the waste generated from the disassembly of the system

  Estimated time to take an adequate number of samples to assure that the system has been decontaminated is included in this section. It also includes the time required to sample the facility to assure that the building has been decontaminated. All estimations include turn around time to receive the results of the samples back from the laboratory. An assumption is made that the results of these samples will show that the facility will require no further decontamination. The useable equipment will be adequately decontaminated and will stay in control of the government for future use. All waste generated in this process will be treated on site or sent to a permitted treatment and disposal facility.

- Sampling and analytical time of the waste generated from the destruction of the facility.

The estimated time is based on the time required to take an adequate number of samples to assure that the debris generated by the removal of the facility has been decontaminated. All estimations include the turn around time to receive the results of the samples back from the laboratory. An assumption is made that the results of these samples will show that the area has been adequately decontaminated and will require no further removal of material as part of this closure plan. The Army will continue to monitor the area for three months after closure. The useable equipment has been adequately decontaminated and will stay in control of the government for future use. All waste generated in this process will be treated on site or sent to a permitted treatment and disposal facility.

10.9.2 Closure Sequence

The sequence to close the USACAMDS Facility and the times to close each system is divided into six phases.

Systems to be closed during each phase are listed below. The estimated days to close each system is provided. The Army will close several of these systems simultaneously. Therefore, the estimated days required to complete closure for each phase is provided also in table 10-5.

TABLE 10-5
Tentative Schedule for Closure of the USACAMDS Facilities

PHASE	MANAGEMENT UNIT	UNIT CLOSURE TIME (days)	TOTAL CLOSURE TIME (days)
I	Rocket Sheer Machine (RSM)	50	200
	Multipurpose Demil Machine (MDM)	80	
	Projectile/Mortar Disassembly (PMD)	50	
	Equipment Test Facility (ETF)	200	
	Material Decontamination Chamber 2 (MDC2)	50	
	Bulk Drain Station (BDS)	60	
	Segregator/Explosive Containment Cubicle #1, Facility (SEG/ECC #1)	60	
II	Munitions Holding Area (MHA)	56	240
	Agent Tanks	55	
	Liquid Incinerator (LIC)	136	
	Material Treatment Facility (MTF)	190	
	Deactivation Furnace System (DFS) Facility	240	
	Deactivation Furnace System (DFS)	158	
	Heated Discharge Conveyor (HDC)	50	
III	Toxic Maintenance Facility (TMF) Tanks	60	140
	Ventilated Storage Area (VSA)	140	
	Residual Storage Area (RSA)	140	
	Toxic Maintenance Facility (TMF)	140	
IV	Metal Parts Furnace (MPF)	85	230
	Metal Parts Furnace (MPF) Facility	230	
V	Brine Dryers	36	140
	Brine Evaporator	36	
	Brine Drying Area Holding Tanks (BDA)	140	
	Filters	162	
VI	Auxiliary Test Facility (ATF)	135	135
	Building 4104	85	
	Building 4105	85	

The total days to close the USACAMDS Facility is estimated to be 1085 days. USACAMDS may submit a proposal to extend closure activities for certain units. The proposal will include justification for the request and the request must be approved by the Executive Secretary.

10.10 CERTIFICATION OF CLOSURE

USACAMDS will submit to the Executive Secretary of the Utah Solid and Hazardous Waste Committee, upon closure of each HWMU, certification signed by the Depot Commander and an independent registered professional engineer that the HWMU was closed in accordance with the facility's approved closure plan. This certification will be submitted within 60 days of closure.

10.11 SURVEY PLAT

The survey plat will be prepared for sites requiring closure in-place. The plats will be certified by a professional land surveyor, and will be submitted to the State of Utah and U.S. EPA. It will be filed at the Property Book Office of Deseret Chemical Depot before or at the time of certification of closure for each unit closed, under the contingent closure plan. A copy of the survey plat will also be available at the DCD Plant Engineer's office.

10.12 FACILITY CLOSURE PLAN (Q.A.P.P.)

The U.S. Environmental Protection Agency (EPA) and the Utah Division of Solid and Hazardous Waste (UDSHW) policy require all Resource Conservation and Recovery Act (RCRA) closure sampling and analysis activities to be under the control of a centrally managed Quality Assurance (QA) program, as stated in the Interim Guidelines and Specifications for Preparing Quality Assurance Project Plan, QAMS-005/80, February 1983. This requirement applies to all environmental monitoring and measurement efforts mandated by the EPA and the UDSHW.

Each investigator is responsible for implementing procedures to determine that the precision, accuracy, completeness, representativeness, and comparability of the data are known and documented. In addition, the investigator should specify acceptable quality levels for data. To meet this responsibility uniformly, each investigator must have a written QA Project Plan (QAPP) for each investigation.

The QAPP presents the specific policies, objectives, organization, functional activities, and QA and quality control (QC) activities designed to achieve the data quality goals of the project. Where possible, existing QA/QC guidelines, policies, programs, and other details are incorporated into the QAPP.

Partial closure plans will be submitted for approval by the Executive Secretary prior to closure for each hazardous waste management unit. These plans will provide information on specific analytes and most current analytical methods.

10.13 PROJECT DESCRIPTION

10.13.1 Project Background

The U.S. Army Chemical Agent Munitions Disposal System (USACAMDS) has been operating since 1979, conducting research and developing various methods for disposing of chemical munitions and treating the wastes resulting from the disposal process. USACAMDS operates as a facility to demonstrate baseline and new technologies for munitions handling, Pollution Abatement Systems (PAS) associated with incineration, and treatment of wastes such as scrap metal, brines, and ash.

Chemical agents are removed from the munitions/bulk items and stored in agent tanks or in Ton Containers (TCs). These containers may be returned to storage before incineration. Spent solutions from decontaminating chemical agents from plant operations and equipment will be treated on-site by incineration. The energetic components of munitions are incinerated in the Deactivation Furnace (DFS). Metal containers, munitions/bulk item bodies are treated in the Metal Parts Furnace (MPF) to remove any chemical agents that remain after the liquids are drained. Contaminated dunnage, mine drums, pallets, waste carbon, scrap metal, filters, and other items are incinerated in the MPF.

Ash from the DFS and MPF is placed in storage before being disposed of at a permitted hazardous waste disposal facility. The metal from the MPF will be certified to meet the Army's 5X decontamination criteria, and will be managed as outlined in the most current version of the Rules. The PAS brine will be dried in the brine dryers or shipped to a TSDF for disposal. The Spent Decontamination Solution (SDS) generated from clean-up operations will be sent to an approved hazardous waste treatment unit.

10.13.2 QAPP Objectives

The QAPP specifies procedures to obtain precise, accurate, complete, representative, and comparable samples, and analyses of these samples, that will permit identification of the compounds of concern.

10.14 PROJECT ORGANIZATION

Primary responsibility for project quality rests with the Commander, USACAMDS, and the Program Manager for Chemical Demilitarization (PMCD). Independent Quality Assurance (QA) review is provided by senior technical reviewers and QA auditors. Table 10-6 shows the personnel responsible for specific QA tasks.

10.14.1 Deseret Chemical Depot

The staff of the Commander, Deseret Chemical Depot, will be responsible for oversight of quality-related aspects of the project.

10.14.2 Program Manager for Chemical Demilitarization

A Quality Control (QC) review team has been organized to meet the specific technical needs of the project. The Project Manager for Chemical Demilitarization will ensure that all work is performed according to the permit conditions and approved plans.

10.14.3 U.S. Army Chemical Agent Munitions Disposal System

USACAMDS reports to the PMCD and is the operator under this permit. The Army will execute the closure plan according to permit conditions and approval plans.

10.14.4 Quality Assurance Manager

The QA Manager provides review and advice on all aspects of QA/QC for analysis of samples. The manager's responsibilities include:

- Verifying that QA procedures for field analysis are as specified in the QA/QC program
- Conducting laboratory audits.
- Conducting QC evaluations and, if necessary, submitting audit samples to assist in reviewing QA/QC procedures.
- Making recommendations to the Sample Manager concerning repeat samples and analysis if problems are detected.
- Checking sample custody procedures to determine if procedures specified in the QAPP are being followed.

Table 10-6
QA ORGANIZATION

QA Task	Responsible Organization/Personnel
Manage project	PMCD Commander for USACAMDS
Project oversight	DCD
Prepare QAPP and supporting documents	Director for USACAMDSPMCD
Review and approve QAPP and supporting documents	PMCD Commander for USACAMDSUDSHW
Conduct performance and systems audits, including corrective action	Commander for USACAMDSPMCD
Conduct QA review and approve reports, SOPs, and activities; audit reports, procedures, and internal corrective actions	Commander for USACAMDSPMCD
Audit sampling records	Commander for USACAMDS PMCD
Approve QA Plan for sample collection and measurements	Commander for USACAMDSPMCD
Approve sample collection activities	Commander for USACAMDS
Assess/accept data	Commander for USACAMDSPMCD

10.14.5 Sample Manager

The primary responsibility of the Sample Manager will be processing of the samples and the analytical data. The Sample Manager will perform the following duties:

- Coordinating the delivery of sample containers and appropriate paperwork for sample collection, custody, and shipping.
- Scheduling analytical laboratory services.

- Processing analytical laboratory services.

- Processing analytical results in parallel with validation and presentation of the results in tabular format for the final report.

10.14.6 Field Manager

The Field Manager will be present at field activities. The Field Manager will coordinate and implement all field activities associated with the sampling and ensure adherence to all QA/QC procedures. The responsibilities include:

- Verifying that before they collect any samples, field personnel are trained and qualified in sampling procedures and field analytical procedures.

- Verifying that field analytical QC procedures, sample plans, and other approved work plans are being followed and preparing field QC data for audit by the QA Manager.

- Participating in the field analytical/sampling quality audits with the QA Manager

10.14.7 Data Manager

The Data Manager will systematically review the analytical data for compliance with the established QA/QC criteria of the basis of spike, duplicate, and blank results provided by the laboratory. The Data Manager will also evaluate data accuracy, precision, sensitivity, and completeness; investigate holding times; and determine data usability. The Data Manager will also provide a system for storing and retrieving the data so that the data can be accessed during closure and for 40 years thereafter.

10.15 QUALITY ASSURANCE OBJECTIVES

Data Quality Objectives (DQO) will be established for each major sample collection effort. DQOs are the quantitative and qualitative descriptions of the data required to support an environmental decision or action. As target values for data quality, they are not necessarily criteria for acceptance or rejection of data. The user of the data develops DQOs for a specific purpose. Everyone from the data gatherer to the analytical laboratory staff is involved in the process from the beginning. The DQO development process involves three stages: (1) defining the question or decision to be made, (2) clarifying and precisely identifying the information required, and (3) designing the data collection program.

The DQOs for the Closure Plan for USACAMDS are as follows:

- To document that hazardous wastes and hazardous waste constituents have been removed from process areas and materials handling areas.

- To document that hazardous wastes and hazardous waste constituents are not present above standards listed in Section 10.6 or RCRA regulations.

- To characterize equipment and materials. This information will be used to determine disposal requirements for these wastes.

The following parameters are indicators of data quality: accuracy, precision, completeness, representativeness, and comparability. *Test Methods for Evaluating Solid Wastes*, (SW-846), describes the accuracy, precision, completeness, representativeness and comparability for each sample parameter. A Utah certified laboratory analyzing the samples will provide the quality control data necessary to evaluate these indicators. The Data manager is responsible for evaluating the data to verify that the data meet the quality objectives. This person will verify that these parameters also meet the requirements in SW-846. The quality of field data and collection procedures will be assessed by observing field sampling techniques, using blank and replicate samples, sample spiking procedures, and proper chain of custody procedures. Laboratory activities will be subject to compliance screening.

10.15.1 Accuracy and Precision

Accuracy is a measure of the agreement between an experimental result and the true value of the parameter. Analytical accuracy can be determined using known reference materials or matrix spikes. Spiking of reference materials into the actual sample matrix is the preferred technique because it quantifies the effects of the matrix on the analytical accuracy. Accuracy can be expressed as the percent recovery (P) as determined by the following equation:

$$P = \frac{SSR - SR}{SA} \, x \, 100$$

where:
SSR = spiked sample result
SR = sample result (native)
SA = spike added

Precision is the measure of the agreement or repeatability of a set of replicate results obtained from repeat determinations made under the same conditions. The precision of a duplicate determination can be expressed as the relative percent difference (RPD), which is determined by the following equation:

$$RPD = \frac{|X1 - X2|}{(X1 + X2)/2} \, x \, 100$$

where:
Xl = first duplicate value
X2 = second duplicate value

For a given laboratory analysis, the replicate RPD values are tabulated and the mean and standard deviation of the RPD are calculated. Control limits for precision are usually plus or minus two standard deviations from the mean, but will be proposed in each partial closure plan for approval by the Executive Secretary.

Accuracy and precision will be monitored by using field replicate, matrix spike, and matrix spike duplicate samples. These data alone cannot be used to evaluate accuracy and precision of individual samples, but will be used to assess the long-term accuracy and precision of the analytical method.

10.15.2 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent parameter variations at a sampling point. Representativeness is a measure of how closely the measured results resemble the actual distribution and concentration of certain chemical compounds in the medium sampled. Section 10.16 of this plan describes the procedures to be used to collect samples. This process will generate samples that are as representative as possible. Documentation of laboratory and field procedures will be used to establish that protocols have been followed and that sample identification and integrity have been maintained.

10.15.3 Comparability

Comparability is the term that describes the confidence with which one data set can be compared to another. Comparability refers to such issues as using standard field and analytical techniques and reporting data in the same units. This criterion becomes important if more than one field team is collecting samples or more than one laboratory is analyzing the samples.

10.16 SAMPLE COLLECTION PROCEDURES

Samples will be collected according to Chapter 9 of SW-846 and Army requirements to determine the sample size and if any contaminants of concern remain. Random sampling schemes will be used unless a more detailed closure plan is required or biased sampling is needed for risk assessment. Some sampling and analysis techniques are being developed for agent related samples. New techniques will be used as they are developed and proven. USACAMDS will collect air, liquid, core, chip, soil, and wipe samples. Samples will be taken from floors, sumps, decontamination solution, and equipment. Samples will be collected from the incinerators, bulk storage units, containerized storage units, and Subpart X units. The entire site will be sampled for soil contamination.

10.16.1 General Sampling Procedures

All sampling projects will use the following procedures:

- Operating and inspection records will be reviewed to determine potential contaminants at each sampling location. Hazardous materials that could be present at the facility will be potential analytes. These materials include, but are not limited to, agent, agent breakdown products, solvents, petroleum-based lubricants, fuels, propellants, explosives, and caustics. Chemical agent will not be an analyte for areas used to store only 3X or nonhazardous materials. Volatile organic compounds will not be considered for decontamination fluids, floors, or equipment. These compounds will volatilize during decontamination activities. A sample for total organic compounds may be collected if necessary to verify decontamination

activities.

- All stained areas will be sampled. Other sample locations will be selected using a random sampling scheme unless required by a more detailed closure plan. The sample size will be determined using SW-846, Table 9-1.

- Sampling information will be submitted to the Executive Secretary for approval with each Hazardous Waste Management Unit (HWMU) partial closure plan.

- Applicable protective gear will be worn depending on the sampling conditions. This could include gloves, overalls, DPE suits, respirators, or other protective gear.

- Grab samples will be collected from all sampling locations. Composite sampling will not be used unless appropriate.

- Each sample will be assigned an individual sample number. The number will be entered into the operating logbook with information necessary to identify the sample location. If necessary, labels may be attached at the sample site to identify the sample location.

- The sample container label will include the sample number, sample collector, date, time, and location.

- A logbook will be kept for each sampling project. Sampling information will be kept in the operating log.

10.16.2 Air Sampling

Buildings where there is any probability of agent, in any amount, are contained and ventilated. The air drawn from these areas is filtered through charcoal filters before being exhausted to atmosphere. These buildings are continuously monitored to provide an early warning when agent is present. The monitoring levels are shown in Table 10-7. Table 10-8 shows which areas have air monitoring.

There are eleven air quality perimeter-monitoring stations, located around the facility as shown in CAMDS drawing TCDS 29-100-01 (see Attachment 11). All eleven stations monitor the ambient air for the presence of agent for historical purposes. The approved limits for general population exposure to chemical agents are shown in Table 10-7. Agent sampling is performed by sequential samplers set to take two 12-hour samples per day. The air sample is taken by Depot Area Air Monitoring System (DAAMS), or equivalent. The sampling setup provides a primary and backup air sample for each sampling period.

TABLE 10-7
AGENT EXPOSURE LIMITS AND AGENT STACK LIMITS

Location	CHEMICAL AGENTCONCENTRATIONS (mg/m^3)				
	GA	**GB**	**H/HD/HT**	**L**	**VX**
Maximum Allowable Stack Concentration[1,2]	0.0003	0.0003	0.03	0.03	0.0003
General Population Limit[1,3] (Averaging Time 72 Hours)	0.000003	0.000003	0.0001	0.0001	0.000003
IDLH ($mg/m^{3)}$	0.2	0.2	0.003[4]	not est.	0.02
Work place Time Weighted Average[1,3] (Averaging Time 8 Hours)	0.0001	0.0001	0.003	0.003	0.00001

Notes:

1 Public Law 91-121/144 (U.S.C. 1512) mandates that the United States Department of Health and Human Services (HHS) review the plans for transporting and/or disposing of lethal chemical agents and make recommendations for protecting human health and safety. HHS delegated review and recommendation authority to the Centers for Disease Control (CDC).

2 The Department of Army proposed the maximum allowable stack concentrations indicated in Table 10-7. HHS reviewed the concentrations and announced in the March 15, 1988 Federal Register (53 FR 8504) [corrected in 53 FR 11002, April 4, 1988] that the concentrations "met HHS criteria and appear to be more restrictive than limits set on a health basis alone," and therefore made no recommendation for changes.

3 The March 15, 1988 Federal Register (53 FR 8504) [corrected in 53 FR 11002, April 4, 1988] announced that CDC concluded that the concentrations indicated in Table 10-7 will adequately protect human health; "even long-term exposure to these concentrations would not create any adverse health effects."

4 IDLH levels have not been established for mustard. The value given is a gross detection level.

CDC determined that the current available data precluded acceptable exposure limits for mustard agents from being precisely defined. CDC concluded that the workplace limits will amply protect a general population 1000 meters or more from the demilitarization site or transportation route. Therefore, protection of the general population is dependent upon meeting the workplace limits within the facility.

The Automatic Continuous Air Monitoring System (ACAMS) detector can detect nerve agents GB and VX, and blister agent HD at the Immediately Dangerous to Life and Health (IDLH), the Allowable Stack Concentration (ASC), and the Time-Weighted Average (TWA) limits set by the U.S. Surgeon General for unmasked workers.

The Depot Area Air Monitoring System (DAAMS) can detect chemical agents GB, HD, and VX in ambient air at the TWA limits established by the U.S. Surgeon General for unmasked workers.

10.16.3 Core Sampling

Core samples will be collected where both the concrete or asphalt surface and the soil beneath the surface require sampling. A work plan showing the exact location and number of samples to be collected will be submitted to the Executive Secretary before closure. Sumps will be sampled using this method. Other core samples will be collected from surfaces that do not have a sealant, such as roadways and outside concrete aprons. Core samples will also be taken from cracked flooring. The number of core samples listed in Table 10-8 is based on the number of sumps and the size of the loading areas. The number of cracks in the flooring has been estimated. The core material will be

analyzed for contaminants as described in the "Chip Sampling" section below. Soils will be analyzed as described in the Soil Sampling section below. If the surface material does not stay together, only soil samples will be collected.0.

Portland cement concrete aprons and entryways adjacent to loading and unloading areas will be sampled. The samples will be analyzed to confirm that the chemical agents are not present at detectable levels. Concrete aprons and asphalt entryways will be randomly sampled at a frequency of one every 100 square feet. If a chemical agent is detected above regulatory standards the concrete will be removed or grit blasted and resampled.

Sumps will be sampled for chemical agent and other hazardous constituents depending on the operating record. The sizes of the sump bottoms range from two feet by two feet (four square feet) to eight feet by eight feet (64 square feet). One sample will be collected from sumps smaller than four feet by four feet, or 16 square feet. Two samples will be taken from sumps ranging in size from 16 to 64 square feet. The samples will be taken from cracked areas, the low point of the sump, or equally distanced from the sides.

10.16.4 Chip Sampling

Chip samples may be collected for agent, agent breakdown products, semi-volatile organic compounds, Polynuclear Aromatic Hydrocarbons (PAHs), and TCLP metals. The sealed concrete and epoxy coated floors and sump walls will be sampled by chipping with a sharp instrument such as a coal or geologists hammer. A concrete sample will be collected in stained areas and every 10 feet along the length of each trench collection system, and analyzed for the same parameters as the associated sumps. Chip sampling will be conducted to confirm the effectiveness of the decontamination methods. Discolored areas on floors or sump walls will be sampled. Also, the facilities will be divided into 100 square foot grids to identify sample sites. Each grid will be sampled for chemical agent and other hazardous waste constituents as determined by the operating record. If there is no evidence of contamination, such as staining, a sample will be collected from the center of each grid. If certain areas are highly stained additional samples may be collected. A map showing floor sample locations will be provided, for approval by the Executive Secretary, with the partial closure plans. Table 10-8 shows the estimated number of floor and sump wall samples for each HWMU area.

10.16.5 Soil Sampling

Soil sample parameters may include agent, agent hydrolysis products, Volatile Organic Compounds (VOCs), semi-volatile organic compounds, Polynuclear Aromatic Hydrocarbons (PAHs), PCBs, total metals, agent, semi-volatile organic compounds, and PCBs, depend on records review. Soil samples will be collected using either an auger or a scoop and shovel as described in SW-846 Section 9.2.2.4. The samples will be collected from zero to six inches below grade. PAHs samples will be taken from the surface. Core samples will be taken from the sumps and other areas that will yield a core. The soil from the core will be sampled.

Soil samples will be collected around the high traffic areas. At least two samples will be collected at the edge of the entryways down gradient from the slope of the surface. Additional samples will be collected as needed. The samples will be collected near the edge of the building's loading area. Most samples will be collected to a total depth of six

inches, but based on observations at the time of closure, it may be necessary to collect samples at deeper intervals. Potential analytes are those listed above. If hazardous waste constituents or agent breakdown products are detected, additional samples will be collected in the contaminated areas at 0.5-1.5 feet, 1.5-3.0 feet and 3.0 to 5.0 feet to define the extent of the release vertically. At all sites where soil samples are collected, a sufficient number of samples shall be collected to define the horizontal and vertical extent of contamination and to prepare a risk assessment. Table 10-8 shows the estimated number of soil samples for each HWMU area. The number is based on the samples to be taken around load areas and around the site.

10.16.6 Liquid Sampling

Liquid samples may be analyzed for agent, agent breakdown products explosives, propellants, VOCs, semi-volatile organic compounds, pH, PCBs, and TCLP metals. Liquid samples are collected from tanks and drums. SDS is used in toxic areas only and will be sampled for chemical agent, pH and chlorine. The final rinse water will be sampled for agent, agent breakdown products, pH and other hazardous constituents as determined by a review of operating records. Table 10-8 shows the estimated number of SDS and rinse samples for each HWMU area. SDS samples are collected from each batch of waste to be incinerated. Three batches of waste per area have been used to estimate the number of samples. One sample per agent tank will be collected. The rinse samples are based on one sample for every 2000 square feet of floor space and one sample from each piece of equipment.

Wastes will be sampled according to the Waste Analysis Plan. Reusable sampling equipment will be decontaminated. Disposable sampling equipment will either be left in the waste container or rinsed prior to disposal. Trip blanks will be prepared for any liquid VOC samples.

Rinse water will also be sampled from the storage tanks for chemical agent, agent breakdown products and other hazardous constituents as determined by a review of the operating record. The sample results will be used to determine if the decontamination effort was effective.

10.16.7 Wipe Sampling

Chemical agent wipe samples are collected using one gram of clean glass wool. The glass wool is wiped over a one square foot area of the surface being sampled. The wipes are put into a glass jar and transported to the analytical laboratory. The wipe samples for chemical agent are analyzed using established analytical procedures. These procedures do not have an analytical method number, but a copy of the method will be submitted for approval by the Executive Secretary before the method is used. One wipe sample will be collected from the incinerators and equipment after decontamination and rinsing is complete. Two samples will be taken from each tank, one from the interior and one from the exterior surfaces. Table 10-8 shows the estimated number of wipe samples for each HWMU area.

10.16.8 Sampling at Treatment, Storage and Subpart X Facilities

USACAMDS will collect air, core, soil, chip, liquid, and wipe samples from within the facilities according to the above referenced procedures. The samples will be from floors, sumps, equipment, SDS, and washing fluids. Table 10-8 summarizes the number of sample locations in each HWMU.

10.16.8.1 Incinerators

The exterior surfaces of the incinerators will be sampled for agent using ACAMS or DAAMS and wipe samples. Samples for other hazardous constituents may be collected after reviewing the operating records. Decontamination solution and rinse water will be managed as described in the "Liquid Sampling" subpart of this section. Core and chip samples will be collected from each sump. Chip samples of the floors will be collected. The sampling plan will be developed using the criteria in this document. The interior of the incinerators will not be sampled.

The DFS will be sampled for agent, explosives, propellants and PCBs. Other analysis may be performed depending on the operating record. The BIF and associated sump will be closed with the MPF.

Table 10-8
SUMMARY OF ESTIMATED CLOSURE SAMPLING REQUIRED

		Air	Core[1]	Liquid Wastes		Soil[2]	Chip[3]	Wipe
				SDS	Rinsate[1]			
1	**Incinerators**							
	Deactivation Furnace System	X	3	3	2	2	9	3
	Liquid Incinerator	X	6	3	2	-	8	3
	Metal Parts Furnace	X	7	3	6	2	31	3
2	**Bulk Storage**							
	Agent Tanks	X	6	1[4]	7[5]	-	3	14
	Brine Drying Area Holding Tanks	X	6	1	5	-	3	10
	Toxic Maintenance Facility Tanks	X	6	1	2	-	3	4
3	**Containerized Storage Areas**							
	Auxiliary Test Facility	X	-	3	2	-	4	1
	Building 4104	-	-	-	1	-	4	-
	Building 4105	-	-	-	5	-	20	-
	Equipment Test Facility (ETF)	X	5	3	3	2	9	1
	Munitions Holding Area (MHA)	X	1	3	3	2	9	1
	Metal Parts Furnace (MPF) Area	-	2	-	12	-	5	11
	Residual Storage Area (RSA)	X	2	3	2	-	5	1
	Material Treatment Facility (MTF)	X	2	3	2	-	5	1
	Ventilated Storage Area (VSA)	X	2	3	2	-	5	1
	Segr/Expl. Cont. #1 (SEG/ECC#1)	X	2	3	3	-	5	2
	Toxic Maintenance Facility (TMF)	X	2	3	5	-	5	4
4	**Subpart X**							
	Brine Drying Area (BDA)	-	6	-	24	-	15	21
	Brine Drum Dryer	-	-	-	3	-	-	3
	Brine Evaporator Dryer	-	-	-	3	-	-	3
	MDF	X	8	3	9	-	13	6
	Bulk Drain Station	X	-	-	1	-	-	-
	MDM	X	-	-	1	-	-	-
	PMD	X	-	-	1	-	-	2
	HDC	-	-	-	5	-	DFS	2
	RSM	X	-	3	4	-	DFS	3
	MDC 2	X	-	3	2	-	4	1
5	**SAF Sump**	**-**	**2**	**-**	**1**	**1**	**1**	**-**

Notes:
1 Core samples are from the sumps and from the loading areas of the DFS, MPF, MHA, and ETF.
2 The rinsate samples are from washing the floor and from rinsing the equipment.
3 The chip samples are from the sumps and floors.
4 The waste in the tanks is agitated and one sample pulled prior to disposal. Each time a batch is sent to the incinerator, a sample is collected.
5 One-rinse sample will be taken from each tank.
5 The agent tanks are located in the SEG/ECC#1, MDF, and the LIC.

10.16.8.2 Bulk Storage Areas

Spent decontamination solution will be agitated in the tank and sampled prior to disposal. One sample will be collected for each batch of waste sent to the incinerator or containerized and solidified for disposal off-site. Tanks will be sampled for agent, agent breakdown products and other hazardous constituents. The tanks will be monitored with

ACAMS or DAAMS. The location and number of wipe samples taken from each tank will be outlined in updated closure plans that will be submitted for approval by the Executive Secretary before closure. The sumps will be sampled using the process described in the Sump section above. The equipment, floors and structure will be decontaminated as described in Section 10.5.

Secondary containment systems will be decontaminated and rinsed. After washing is completed, chip samples of the floor surface will be obtained. At least three samples will be taken from the floor of each vault or liner system surrounding each tank system. Additional samples will be collected as needed. These samples will be analyzed for hazardous materials as determined from reviewing the operating record. If sample results are above hazardous waste levels, the floors and/or sumps that are not clean will be washed again until a clean sample is obtained. The area immediately surrounding the tank system will be sampled in a random pattern between 1 and 5 feet outside the walls of the vaults or liners surrounding the tanks.

10.16.8.3 Permitted Container Storage Areas

All storage areas will have chip samples collected from the floors and sumps as described in the chip sampling section. Wipe samples will be taken from the equipment used in the areas. Facilities used to store chemical agent will be monitored using ACAMS and DAAMS. These facilities are the ATF, MHA, RSA, VSA, SEG/ECC#1, ETF, MTF, MDM/CG, MPF Charge Car Room, MDF Toxic UPA, BIF Agent Drain Bay, MDF/BIF Airlock, MDF/BIF Unloading Area, and the TMF. Facilities that are not used to store chemical agent are Building 4104, Building 4105, and MPF.

The SEG/ECC#1 and the ETF will be sampled for explosives. The apron and soil around the loading docks at the MHA will be sampled as described above.

10.16.8.4 Subpart X

MDM, the Bulk Drain Station, MDC2, and the RSM will be decontaminated. The spent decontamination solution from these operations will be sampled. The area will also be monitored by ACAMS or DAAMS. Rinse water from cleaning the equipment will be sampled and analyzed.

Subpart X equipment is located near other HWMUs, such as the DFS and MPF. The decontamination of floors and other equipment where this equipment is used will be addressed in the facility closures. The Brine Drying Area has various types of equipment that will be rinsed and sampled.

10.16.9 USACAMDS Site Sampling

USACAMDS is engineered with safeguards to prevent facility operational failures. However, if an unplanned release occurs, soil sampling will be conducted to verify that the facility soil does not pose a threat of post-closure escape of chemical agents or other hazardous waste to the environment.

Soil on, around and under (when possible) the regulated waste management units and all hazardous waste loading/unloading areas will be sampled and analyzed for chemical

agents processed in each respective area, agent breakdown products and hazardous waste constituents that may have been used in the area in concentrations above background. A complete list of sample parameters will be provided to the Executive Secretary for approval after records are reviewed, but before sampling begins. Background values are found in Table 10-10 of this document. At least two samples from each loading area will be collected. Additional samples will be collected at the surface and subsurface as necessary. If initial surface sampling analytical results (i.e., 0-6 inches) show contamination, samples may be collected from deeper intervals. CAMDS will coordinate with the State as necessary before collecting samples from deeper intervals.

Random soil samples will be collected around the USACAMDS site. The site has been divided into 80 foot by 80-foot grids. The potential sampling points that fall on facilities have been eliminated. A total of 70 sites were left. Every other grid will be sampled. Grids will be sampled for agent hydrolysis products, total metals, SVOCs and VOCs. Sampling will be biased towards stained grids and stained areas within each grid. If stained areas are not noted, five samples will be collected within each grid. One sample will be collected at the center of each grid and four samples will be collected at equally spaced compass points around the center. The soil from the five samples will be homogenized in a stainless steel bowl and a composite sample from each grid will be prepared. For VOCs, soil from each of the five sample locations in each grid should be placed in the sample container without mixing (if better methods, such as placing the soil in an extraction fluid become available before closure, the improved methods will be used). The laboratory will be notified as to the manner in which the VOC samples are collected. The sample results will be used to determine if a statistically significant number of sample nodes have been collected using SW-846, Chapter 9, Section 9.1.1.3.1. Additional samples will be collected if the calculations show a need. Drawing TCDS 40-100-09 shows the USACAMDS with the 80 X 80 grid.

Commander's representative will review all facility operating records pertaining to spills, releases, or other unplanned events. In areas where documentation of the cleanup and follow-up verification sampling does not indicate that the release was removed to background levels, verification sampling will be repeated for closure. Table 10-10 shows background values for total metals.

10.16.9.1 Transportation Route Sampling

On-site transportation routes that may have been exposed to chemical agents will be sampled for agent hydrolysis products. Also, USACAMDS will sample for other hazardous waste constituents as determined by a review of the operating records. Results will be evaluated to confirm that hazardous constituents are not present at concentrations above regulatory limits or background levels. Table 10-10 shows background levels.

Chip samples of the road surface will be collected in obviously contaminated areas or every 500 linear feet along the centerline crown. From each sampling point, grab samples will be taken and analyzed for chemical agent and other hazardous waste constituents transported along the roadways. If chemical agent or hazardous waste constituents are detected above the established regulatory or background levels, additional sampling on 10-foot centers in each direction will be conducted to determine the extent of contamination. Asphalt areas that are contaminated will be removed for disposal.

10.17 SAMPLE HANDLING

A required part of any sampling and analytical program is the integrity of the sample, from sample collection to data reporting. This includes the ability to trace the possession and handling of samples from the time of collection, through analysis, and final disposition. The essential components of this chain are summarized below.

10.17.1 Handling of Samples in the Field

The field sampling personnel are responsible for the care and custody of samples until they are delivered (or shipped) to the laboratory custodian. The sampler will protect the sample from positive or negative contamination by decontaminating sampling tools between each sample site and by protecting the samples from contamination from hand contact. When samples are under control of the sampler, he will keep the samples in view. Samples will be locked when he is away from the samples.

10.17.2 Chain of Custody

The sampler will complete a chain of custody form for samples collected. The form contains sample information and will be signed and dated each time the samples are transferred to another person. The time of transfer will also be recorded. The form will be signed and placed in the transportation container when shipped to an off-site laboratory. The chain of custody will be completed by the laboratory upon receipt. Each sample shipment will be accompanied by documentation that identifies the contents of the shipment.

10.17.3 Custody Seal

The sampler will place a custody seal on the transportation container, such as a cooler, after all the samples are loaded.

10.17.4 Handling of Samples in the Laboratory

A custodian at the laboratory will verify that the containers are intact, verify that the custody seal is intact, and that the documentation accompanying the samples corresponds to the actual contents. Any anomalies, such as broken bottles, elevated temperatures, and missing labels, will also be documented by the laboratory custodian. The laboratory will retain sample identification tags, data sheets, original instrument output records, and logbooks, as part of the final file. If samples are broken or otherwise can't be analyzed, the laboratory will contact CAMDS as soon as possible so replacement samples can be collected.

10.17.5 Sample Disposal

After the analyses have been completed, the samples will be disposed of at a licensed hazardous waste facility according to RCRA regulations.

10.17.6 Data Documentation

All data will be documented by the laboratory to meet the specific requirements for data submitted for analyses as described in Section 10.19.

10.17.7 Final File

The final file will contain raw laboratory data in addition to sample transfer documentation summaries of quality control checks and analytical results.

10.18 EQUIPMENT CALIBRATION

Various instruments, equipment, and sampling tools will be used to collect data and samples and to monitor site conditions. Instruments and equipment must be calibrated, maintained, and used properly to collect high-quality data. A record of calibration and maintenance activities is as important as the data record itself to verify the quality of the data. The record will be available for review upon request.

10.18.1 Calibration of Field Equipment

Field equipment that will be used to demonstrate clean closure of USACAMDS may include:

- Automatic Continuous Air Monitors (ACAMS)
- Depot Area Air Monitoring System (DAAMS)
- MiniCams
- Photoionization detectors
- Immunoassay kits and other on-site analytical methods

These monitors will be used for a period of 3 months after decontamination is complete to provide supporting data that decontamination of the facility is complete.

The field equipment is calibrated using standard procedures developed at USACAMDS.

The calibration of the ACAMS is checked daily. The calibrations of the instruments for analysis of DAAMS samples are done at the beginning of each shift.

10.18.2 Laboratory Calibration

The laboratory personnel are responsible for calibration and maintenance of equipment and instruments following calibration criteria consistent with Utah State laboratory certification. Manufacturers' maintenance schedule is followed for preventive maintenance.

10.19 ANALYTICAL PROCEDURES

Samples collected during the closure will be analyzed at a state certified laboratory for parameters except chemical agents GA, GB, H, L, and VX. Table 10-9 summarizes the analytical methods. Whenever possible, analytical methods were selected from SW-846, *Test Methods for Evaluating Solid Waste*, 3rd edition. Methods for analyzing military-unique compounds were selected from United States Army Environmental Hygiene Agency (USAEHA), PMCD, Rocky Mountain Arsenal, and other methods contained in

the USACAMDS Part B Permit. These methods have not all been demonstrated as applicable to the matrices to be analyzed for this project; they are, however, the methods currently available and they will be adapted, if necessary, during use to provide the required data.

The reporting limits of SW-846 methods are based on the data presented in the method. The limits are generally for detection of analytes in reagent water. These reporting limits are extremely matrix dependent and may not be achieved in every sample. All sample results that do not meet generally acceptable reporting limits will be flagged.

10.19.1 Sample Matrices

To comply with the requirements of the closure plan, samples of several media may be analyzed for the parameters in Table 10-9. Sample requirements will be determined from a review of operating records for each hazardous waste management unit. The media to be analyzed include the wash water to rinse the facilities, samples of the asphalt roadways serving the facility, samples of the dirt adjacent to the roadways and surrounding the building, and samples of scrapings from the epoxy-coated concrete floor within the facility. Wipe samples from various surfaces will also be collected for agent. A description of the sampling locations, quantities of samples, and sampling procedures will be provided with the partial closure plans submitted at the time of closure.

The high organic hydrocarbon content of the asphalt may interfere with analysis of all parameters in that matrix. Similarly, the lack of suitable methods for extracting and preparing epoxy-coated cement floor scrapings may affect the quality of the analytical results for that matrix.

Table 10-9
SUMMARY OF ANALYSIS

Matrix	Analytical Method	
	Solids	**Liquids**
GB	LAB[1] 32-10-04-01	LAB 32-10-04-01
VX	LAB 32-20-01-01	LAB 32-20-01-01
HD	LAB 32-03-01-02	LAB 32-03-01-02
GA	**Developing SOP**	**Developing SOP**
L	Not available	Not available
GB/VX hydrolysis products	AEC[2] Method LT04	NA
HD hydrolysis products	AEC Method UL109	NA
Tetryl	SW-846[3] Method 8330	SW-846 Method 8330
RDX	SW-846 Method 8330	SW-846 Method 8330
TNT	SW-846 Method 8330	SW-846 Method 8330
Nitrocellulose	Not Available	Not Available
Nitroglycerin	SW-846 Method 8332	SW-846 Method 8332
VOCs[1]	SW-846 Method 8260B	SW-846 Method 8260B
Semi VOC's	SW-846 Method 8270C	SW-846 Method 8270C
PAHs[2]	Proposed SW-846 Method 8075	NA
pH	SW-846 Method 9045C	SW-846 Method 9045B
PCBs	SW-846 Method 8082	SW-846 Method 8082
Total Metals	SW-846 Methods 7060A, 7081, 7131A, 7191, 7421, 7471A, 7740, 7761	NA
TCLP Metals	SW-846 Methods 7060A, 7081, 7131A, 7191, 7421, 7471A, 7740, 7761	SW-846 Methods 7060A, 7081, 7131A, 7191, 7421, 7471A, 7740, 7761

Notes:
1.) Lab indicates USACAMDS Standing Operating Procedures.
2.) AEC indicates Amy Engineering Center.
3.) SW-846 indicates Test Methods for Evaluating Solid Waste

Solid samples could consist of soil samples, chip samples, scrap samples, wipe samples, residue samples, and laboratory liquid wastes.

Liquid samples could consist of pollution abatements brines, SDS, laboratory liquid wastes, and rinsates.

10.19.2 Rational for Specific Analysis

Samples will be analyzed for the items identified in table 8-1 based on the following rationale. A complete rationale for sample selection is discussed in section 10.16.

10.19.2.1 Agent (GB, VX, HD, GA, and L)

Samples taken from areas that have been in contact with agent or have had the potential to have been exposed to agent will be analyzed for the presence of agent. This analysis will assure that detoxification of the media is less than the 3X level. Samples are from liquids or solids.

10.19.2.2 Agent Hydrolysis Products

Soils samples taken from areas that have had the potential for agent exposure and random areas throughout the USACAMDS site will be analyzed for hydrolysis products.

10.19.2.3 Explosive and Propellents (Tetryl, RDX, TNT, Nitrocellulose, Nitroglycerin)

Samples taken from areas that have treated or stored munitions, such as the DFS, ETF, MHA, and their associated unload areas; will be analyzed for explosive and propellent residues. Samples could be taken from liquids or solids.

10.19.2.4 VOCs

Soil samples will be analyzed for VOCs.

10.19.2.5 Semi VOCs

Soils samples may be taken from areas suspected to contain semi volatile contamination or where operating record information indicates semi volatiles could have been present. Asphalt will not be analyzed since semi volatiles will be naturally present in this media. Samples could be taken from liquids or solids.

10.19.2.6 Polynuclear Aromatic Hydrocarbons (PAHS)

Soils samples will be analyzed for PAHS. The soil will be checked for possible air emissions contamination. Asphalt will not be analyzed since PAHS will be naturally present in this media.

10.19.2.7 pH

Spent decontamination solutions will be analyzed for pH.

10.19.2.8 Polychlorinated Biphenyls (PCBs)

Solid samples taken from the MHA, DFS, and the ETF will be analyzed for PCBs. The rinsate from these areas will also be analyzed for PCBs. Areas that have PCB capacitors and transformers will be sampled for PCBs.

Soil samples will be checked for total metals based on operating records. The results will be compared with established background levels found in Table 10-10.

10.19.2.9 TCLP Metals

Samples from solids such as salts, ash, and soils will be analyzed for TCLP metals. Rinsate may also be sampled for TCLP metals. Samples of these materials will be analyzed to identify if the material is a characteristic waste.

10.19.3 Method Substitution

As more suitable, appropriate, and demonstrated methods for analyzing chemical agents in environmental samples become available, they may be used in place of the methods presented in this document. The analytical plan will be reviewed before closure to assess the continued applicability and appropriateness of the listed methods to satisfy the objectives of the closure plan.

10.20 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting are steps taken for good quality data management.

10.20.1 Data Reduction

Data reduction consists of the review, manipulation, and calculations performed to translate raw laboratory output to the final laboratory reports. All data reduction will be performed in the laboratory. The laboratory will retain copies of all laboratory worksheets, laboratory notebooks, calculation worksheets, standard records, maintenance records, calibration records, and associated quality control records. These sources will be available for inspections and audits to assess the quality of the analytical data.

10.20.2 Data Validation

Data validation is the review of laboratory analytical data to assess the quality of the data and to evaluate if it can be used in meeting closure objectives. Data validation will be performed by the Data Manager.

The Data Manager will review and assess a minimum of ten percent of all sample-specific analytical data, associated field and laboratory QA/QC data, and raw laboratory data to evaluate the performance of the laboratory. The data to be reviewed will be selected at random.

The Data Manager will evaluate instrument calibration and performance, compliance with required holding and analysis times, and analyte identification and quantification. The Data Manager will also analyze the data from field and laboratory blanks to determine the possible presence of contamination in the samples. The accuracy of the analysis will be determined by assessing recoveries of surrogate compounds and by analyzing spiked samples. Precision will be determined by analyzing duplicate samples. Matrix spikes and matrix spike analyses will also be used to determine if the characteristics of the sample matrix may adversely affect the quality of the sample analyses.

The control limit goals for surrogate recovery, matrix spike and matrix spike duplicate, replicate and duplicate results will be provided to the Executive Secretary for approval before closure. Data validation will include a comparison of control limit goals to actual results.

The actual performance of the laboratory will be compared to the performance criteria of the analytical method and this attachment. The Data Manager will note any deficiencies and, where possible, assess the impact of the deficiencies on the quality of the data. The reviewed data will then be compared to the DQOs and the project-specific requirements to determine if it can be used to support project decisions. Data may be (1) acceptable for use, (2) acceptable for use with qualifications, or (3) unacceptable for use. Where the data are found to be acceptable with qualifications, or unacceptable, it may be necessary to analyze additional samples to obtain sufficient usable data to meet project DQOs.

10.20.3 Reporting

10.20.3.1 Contents of Report

The laboratory report shall contain, but not be limited to, such information for samples as:

- Date the report was prepared
- Sample identification number
- Name and location of sample
- Sample medium (water, soil, etc.)
- Date the analysis was performed
- Any special circumstances or comments that may be relevant for interpreting the data
- Name of parameter analyzed, name or number of approved analytical methods used, results of analysis, units of the reported results, sample dilution factors, percent moisture and detection limits.
- EPA or USAEC data qualifiers.

10.20.3.2 Records

Copies of all records related to field sampling and laboratory analysis of the samples will be retained by the laboratory. These records will include, but not necessarily be limited, to field notebooks, laboratory notebooks, laboratory worksheets, copies of raw laboratory data, copies of QA/QC results associated with each sample, and laboratory instrument performance data associated with the samples. There must be sufficient information in the files to identify the record, the sample it is associated with, and the activity to which it applies.

10.21 QUALITY CONTROL CHECKS

QA/QC samples will be collected to check the adequacy of sample collection and analysis and to monitor laboratory performance.

Duplicates, blanks, and spiked samples are used to test the sampling technique to determine if the technique affects the analytical results, to measure the internal consistency of the samples, and to estimate any variance or bias in the analytical process. The field and laboratory QA/QC sampling procedures are described below.

10.21.1 Quality Control Procedure for Field Sampling

Quality control replicate (split) samples and blanks are used to provide a measure of the internal consistency of the samples and an estimate of variance and bias.

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. Three types of blanks will be generated during sampling activities: trip blanks, rinse blanks and field blanks.

One trip blank will be included with each daily shipment of volatile organic samples. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the sampling bottles, and returned unopened for analysis. Trip blanks will indicate if there is any contamination during shipment to the field, from storage in the field, or from shipment from the field to the analytical laboratory.

One field blank will be included with each daily shipment of samples. The field blanks will indicate if there is any contamination from the sampler or from handling of the sample bottle in the field. The sample container will be filled with distilled, deionized water in the field at the time of sampling. Rinse blanks may be substituted for field blanks. Preservatives will be added as appropriate and the sample container capped, packed, and shipped with the samples. At sites where dedicated equipment is not used, rinse blanks will be collected at a frequency of 1 in 20 samples.

One field replicate (duplicate) sample will be obtained for every 10-field samples collected. The sampling station from which the duplicate is taken will be randomly selected for each event. Each replicate sample will be split evenly into two sample containers and submitted for analysis as two independent samples.

QA and QC samples for chemical agent analysis will be prepared as described in Site Plan 49-01 (see Attachment 2 for current revision). These samples test the entire sampling and analysis system for consistent data.

10.21.2 Quality Control Procedures for Laboratory Analyses

The quality control procedures for the laboratory will be consistent with SW-846 procedures. This will include the use of matrix spikes and matrix spike duplicates in a separate aliquot of one sample selected from 20 field samples at each site and for each media sampled. These spikes will be used to assess accuracy and precision.

10.22 PERFORMANCE AND SYSTEMS AUDITS

Audits of laboratories and field activities will be conducted at least once per calendar quarter. The audits will, in general, be used to verify that:

- Approved procedures are in place and functioning
- An acceptable calibration program is in place
- An organization structure is in place
- Personnel responsibilities are clearly defined
- A training program for personnel is in place and current
- A chain of custody program and records retention program are in place
- Corrective actions taken by laboratory and field personnel for variances are responsive and timely.

10.22.1 Laboratory Performance and Systems Audits

The analytical laboratory will conduct both internal and external quality control checks. External quality control checks. External quality control checks include participating in the Army's Chemical Agent Standard Analytical Reference Material (CASARM) program in which laboratories analyze QC samples of known concentrations received from the Edgewood Research Development and Engineering Center (ERDEC). Internal quality control checks (replicates, spikes, and duplicates) are performed.

10.23 PREVENTIVE MAINTENANCE

Routine maintenance procedures and schedules for sampling equipment are described in the manufacturers' instruction manuals. All records of inspection and maintenance will be dated and documented in a field notebook.

Maintenance procedures and schedules for all field and laboratory analytical instruments will be in strict accordance with the recommendations of the equipment manufacturers. Routine maintenance will be performed by laboratory personnel as needed. All records of inspection and maintenance will be dated and documented in laboratory record books.

Laboratory maintenance procedures will be consistent with the requirements developed by USACAMDS.

10.24 DATA ASSESSMENT PROCEDURES

The precision and accuracy of data will be assessed to ensure that they meet the requirements of the DQOs as described in Section 10.15. If enough data are generated, the precision, accuracy, and completeness may be assessed using statistical procedures. The relative percent difference (RPD) is used to calculate the precision between two samples:

$$RPD = \frac{|X_1 - X_2|}{\frac{X_1 + X_2}{2}} \times 100$$

Where:
X_1 and X_2 are the reported concentrations for each sample.

Relative Standard Deviation (RSD) is used to determine the precision among several samples. The formula for this is:

$$RSD = \frac{SD}{\overline{X}} \times 100$$

Where:
SD = Standard Deviation of Initial Response Factors

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(X_i - \overline{X})^2}{N - 1}}$$

And,
$\overline{X}$ = mean of initial relative response factors

Precision is commonly determined from duplicate samples; thus precision is usually expressed as RPD or relative standard deviation (RSD).

Accuracy is commonly presented as percent bias or percent recovery. Percent bias a standardized average error; that is, the average error divided by the actual or spiked concentration and converted to a percentage. Percent bias has no units so it allows the accuracy of analytical procedures to be compared easily.

Percent recovery provides the same information as percent bias. Accuracy is often determined from spiked samples. Percent recovery is:

$$\%recovery = P = \frac{SSR - SR}{SA} \times 100$$

Where:
SSR = spiked sample result
SR = sample result (native)
SA = spike added

Given this definition it can be shown that: % bias = % recovery - 100

Background samples were collected for a Phase II RCRA Facility Investigation in 1993. Other background samples were used in this investigation that were collected in 1991. The investigation determined tentative background values around the USACAMDS site using samples collected at two, five and ten feet below grade. Additional samples were collected at other sites at the Deseret Chemical Depot. Drawing TCDS 40-100-09 shows the sample sites. Detailed information on these samples is found in the Tooele Army Depot-South Area, Final Phase II RCRA Facility Investigation Report Known Releases SWMUs 13 and 17, Volume I, Chapter 5.

Tolerance limits, called Upper Bound Background Threshold limits, were established for the analytes using EPA guidelines for statistical methods. The results of the study are listed in Table 10-10.

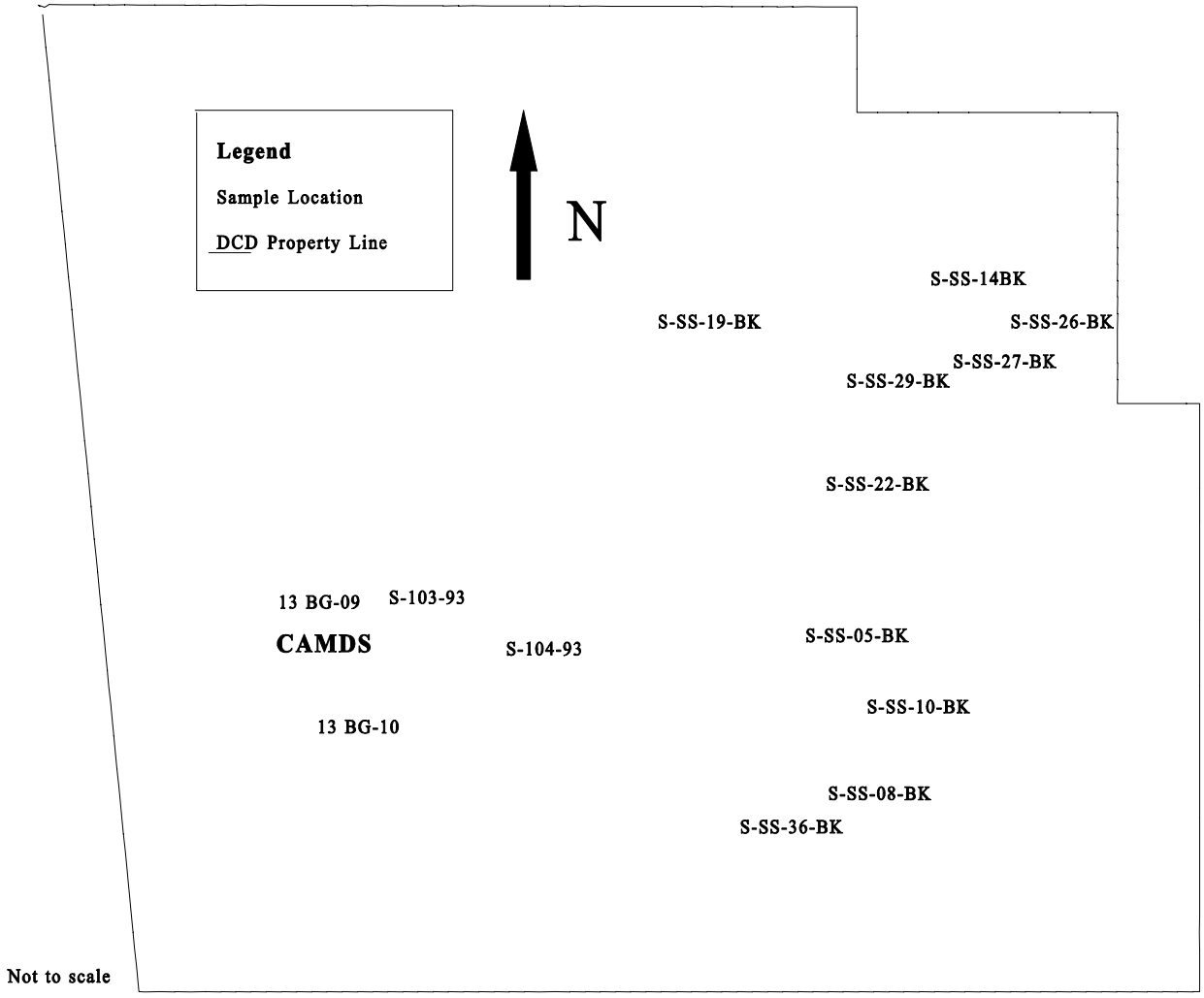

TABLE 10-10*
TEADS BACKGROUND SOIL SAMPLE RESULTS
PHASE II REMEDIAL FACILITY INVESTIGATION (RFI)

Analyte	Min. (µg/g)	Max. (µg/g)	Arithmetic Mean (µg/g)	Standard Deviation (µg/g)	Upper Bound Back-Ground Threshold (µg/g)
Metals					
Antimony	0.5	15.8	3.95	7.67	15.8
Arsenic	3.89	39.0	12.3	1.72	16.4
Beryllium	0.228	1.11	0.498	0.320	1.11
Cadmium	0.894	21.1	1.55	4.27	21.1
Chromium	8.44	56.2	19.6	1.66	23.5
Mercury	0.026	0.319	0.034	0.061	0.319
Nickel	4.92	30.	9.73	8.22	30.0
Copper	3.88	58.1	13.9	1.8	18.1
Lead	7.3	254	36.4	61.4	69.8
Selenium	0.449	5.76	1.62	2.72	5.76
Silver	0.095	7.61	0.589	1.555	7.61
Thallium	33.4	68.6	17.7	7.42	68.6
Zinc	21.4	232.0	58.8	1.75	62.9

*Note:
The values in this table are preliminary. The permittee must submit a written report of all data used to determine Upper Bound Background, min., max., mean, and standard deviation metals levels prior to acceptance of these levels by the Executive Secretary. The Phase II RFI for USACAMDS has not been approved by the Executive Secretary as of the date of this application.

Using the guidelines of Table 9-1 and section 9.1.1.1 of SW 846, an 80% confidence interval will be calculated from the field samples. The upper confidence limits will be compared to the upper bound background Threshold from Table 10-10. When the confidence level is greater than the threshold, the media will be considered contaminated and will require remediation or a risk-based assessment. When it is less than the threshold, no further action will be taken.

10.25 CORRECTIVE ACTIONS

Corrective Action plans and procedures will be consistent with or more stringent than those developed by USACAMDS.

Corrective action plans will include the corrective actions, maintenance instructions, and calibration procedures for each individual piece of equipment specified or suggested by the manufacturer. Corrective actions will also include training/retraining of personnel, as necessary and appropriate. Corrective actions may also include revised procedures and validation testing of revised procedures prior to implementation as experience may suggest.

10.26 QUALITY ASSURANCE REPORTS

A QA report will be completed monthly to summarize the QA/QC status of the closure project and any problems. The report will be an assessment of the measured QA parameters; for example, precision, accuracy, and results of performance audits; any

reported nonconformance; and any significant QA problems and the recommended solutions. Any change in the QAPP will be summarized in a report to the PMCD

During closure, a separate report will be submitted annually to the Utah Division of Solid and Hazardous Waste to describe the QA/QC achieved for chemical agent monitoring.